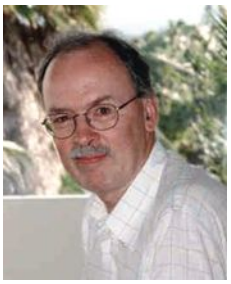
PHYSICAL BIOSCIENCES DIVISION
NEWSLETTER

October 26, 2006

Christopher Somerville, new Visiting Faculty, awarded Balzan Prize



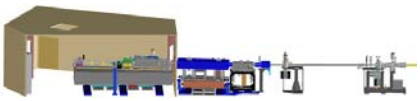
Christopher Somerville, who in August became a PBD Visiting Faculty Member, has been awarded the prestigious International Balzan Prize for his work in plant molecular genomics. Not bad, considering that former prize winners include Jean Piaget, Pope John Paul, and Mother Teresa. Along with Eliot Meyerowitz at Caltech, Dr. Somerville helped establish *Arabidopsis* as a model organism, which the Prize Committee stated has "far reaching implications for plant science, both on a fundamental level and in potential applications." Dr. Somerville is the Director of the Carnegie Institution Department of Plant Biology, and Professor of Biological Sciences at Stanford University. His research interests focus on understanding how plant cell wall polysaccharides are synthesized, how the structures relate to the functions of the cell wall, and how the system is regulated. "I believe that knowledge of cell wall structure and function will facilitate the development of plants with improved utility as sources of renewable materials and as biofuel feedstocks," remarked Somerville, who will play a key role in Division and Lab efforts to develop cellulosic ethanol and other solar-to-fuel science and technology.

PBD leads Lab-effort on cellulosic ethanol

Lab Director Steve Chu considers the search for sustainable, carbon-neutral energy "the most important scientific challenge we face today." That's why Berkeley Lab is partnering with Lawrence Livermore and Sandia Naitonal Labs to respond to the DOE's $250M call to develop two major, multidisciplinary Bioenergy Centers. The Joint BioEnergy Institute (JBEI) has a goal of using rapidly advancing scientific areas such as nanotechnology and synthetic biology to transform the biofuel industry in California and the entire nation. The research effort will focus on engineering feedstocks and biomass deconstruction, as well as designing microbial biosynthesis pathways to ethanol and other transportation fuels. Learn more about the initiative at http://www.jbei.org/

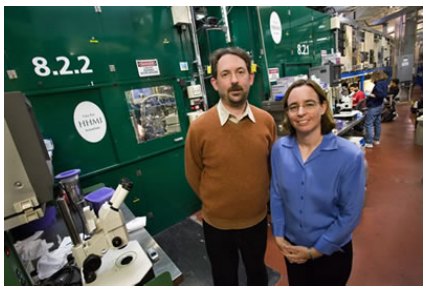
Ribbon cutting celebrates launch of the National Center for X-Ray Tomography

The National Center for X-ray Tomography (NCXT) was officially dedicated on October 11, 2006, at the Advanced Light Source. This first-of-its-kind x-ray microscope will enable scientists to perform three-dimensional "CAT scans" on biological cells, just one of many unprecedented capabilities for cell and molecular biology studies. X-ray microscopy is expected to bridge the capabilities gap between light and electron microscopy, combining some of the best features of each and adding entirely new ones. For example, hydrated biological samples can be rapidly frozen and scanned without any chemical alteration or staining. The quick turnaround time between sample preparation and data collection will allow scientists to accumulate a large volume of data very quickly, and the images obtained (at 25-nanometer resolution) are ideally suited for quantitative analysis. "X-ray microscopy is an emerging new technology that expands the imaging toolbox for cell and molecular biologists, and we are going to make this technology available to the greater biological community," said principal investigator and PBD microscopy expert Carolyn Larabell, who built the microscope with co-principal investigator and Berkeley Lab physicist Mark Le Gros.



Major new BCSB grants will speed structure solution

New grants totaling $13M will increase the high-throughput capabilities at the Berkeley Center for Structural Biology (BCSB). The Howard Hughes Medical Institute has awarded $4.8 million to upgrade the robotic capabilities of their crystallography beamlines at the Advanced Light Source, and the National Institutes of Health has awarded an $8.2 million grant to further develop a software program called PHENIX, which automates crystallography data acquisition and analysis. "More and more scientists have come to realize that automating macromolecular crystallography leads to better results," said Paul Adams, an authority on crystallography who heads the BCSB. "In the time it takes to screen one or two crystals by hand, automation enables ten or twenty crystals to be screened. The ability to screen many samples prior to data collection enables researchers to focus their studies on the very best samples."



PBD robotics team awarded Halbach Prize

Carl Cork, John Taylor, Gyorgy Snell, and members of the Engineering Division have received the Klaus Halbach Prize for 2006. The Halbach Prize, given yearly for innovative instrumentation at the Advanced Light Source (ALS), was awarded to the PBD-led team for developing a system that automatically mounts and aligns protein crystals for high-throughput structural biology. The pioneering technology in applying robotics to improve the quality and throughput of x-ray crystallographic data was so successful at the ALS that it expanded to the National Synchrotron Light Source, the Cornell High Energy Synchrotron, and three sectors of the Advanced Photon Source, and continues as part of an instrument development program spanning the four sites. The Halbach Prize is given in honor of LBNL scientist and engineer, Klaus Halbach, whose development of insertion devices such as wigglers and undulators was critical to the now common use of third-generation synchrotrons as research resources. The robotic automation program is funded by the National Institute of General Medical Sciences of the National Institutes of Health. Congratulations to the team for their excellent work!

Got property? LBNL property review reports coming soon

DOE's annual equipment inventory starts January 1, so we're asking all property custodians to review their *Property Verification by Signature* reports. These are in the mail and due back to Brigitte Roberts (Calvin Lab) by November 1. Please make sure to:

- Note new location if an item has moved
- Request steward change if an item is now in use by other divisions
- Request new DOE property numbers in case an item original label is lost, worn or illegible
- Request that property no longer in use be salvaged
- Request the return of assets that are in use by staff no longer affiliated with LBNL

Any assets currently used at home require an LBNL Property Pass. If you don't have one, contact Brigitte (x4205) for the form and return it completed along with the report. Also, items on loan to other institutions must have formal loan agreements in place, and the usual Property Pass does not substitute for a loan agreement. Please contact Brigitte if you have any questions.

Christopher Voigt named to TR35

Since 1999, the editors of MIT's Technology Review have honored the young innovators whose inventions and research they find most exciting. Today that collection is the TR35, a list of technologists and scientists, all under the age of 35. Their work--spanning medicine, computing, communications, electronics, nanotechnology, and more--is changing our world. Synthetic biologist Christopher Voigt was chosen for 2006's TR35 list for creating an unusual image: the Virgin Mary on a lawn of *E. coli*. In turning microbes into a "photographic" medium, Voigt and his team have illustrated his approach to synthetic biology: Creating genetic parts that can be used interchangeably to achieve different results. They hooked a light receptor from blue-green algae to a protein that normally controls E. coli genes' response to the cell's surroundings.

New hyper-sensitive MRI technique holds great promise for molecular imaging

PBD researcher David Wemmer and MSD researcher Alex Pines have developed a new technique for Magnetic Resonance Imaging (MRI) that allows detection of signals from molecules present at 10,000 times lower concentrations than conventional MRI techniques. Called HYPER-CEST, for hyperpolarized xenon chemical exchange saturation transfer, the new technique holds great promise for molecular imaging and could become a valuable tool for medical diagnosis, including the early detection of cancer. "Other molecular MRI contrast agents provide small changes in big MRI signals, making the changes difficult to detect when the amount of contrast agent binding is small," said Wemmer. "Our HYPER-CEST contrast agent provides a big change in the xenon MRI signal, which means it is much easier to detect even though the xenon MRI signals are rather small."

Molecular DNA switch found to be the same for all life

The molecular machinery that starts the process by which a biological cell divides into two identical daughter cells apparently worked so well early on that evolution has conserved it across the eons in all forms of life on Earth. Research led by Michael Botchan, Eva Nogales and PBD researcher James Berger revealed that the molecular machinery behind the initiation of DNA replication in Archaea, Bacteria and Eukarya cells is remarkably similar. In two papers concurrently published in the August edition of the journal *Nature Structural and Molecular Biology*, the team report the identification of a helical substructure within a superfamily of proteins, called AAA+, as the molecular "initiator" of DNA replication in a bacteria, *E. coli*, and in a eukaryote, *Drosophila melanogaster*, the fruit fly. Taken with earlier research that identified AAA+ proteins at the heart of the DNA replication initiator in archaea organisms, these new findings indicate that DNA replication is an ancient event that evolved millions of years ago, prior to when Archae, Bacteria and Eukarya split into separate domains of life. Berger, a biochemist and structural biologist who participated in both studies, noted that "[o]ur findings of evolutionary kinship between the DNA initiators in all three domains make sense because, to paraphrase Francois Jacob, the one thing a cell wants to do is to become two cells," said Berger, "A cell can't do this if it doesn't replicate its DNA in the right place, at the right time, and in the right manner, while simultaneously avoiding over-replication." More from LBNL science writer Lynn Yarris at Science@Berkeley Lab

More about these and other stories at our website:

pbd.lbl.gov